

REMARKS

This is intended as a full and complete response to the Office Action dated November 2, 2005, having a shortened statutory period for response set to expire on February 2, 2006. Please reconsider the claims pending in the application for reasons discussed below.

In the specification, the paragraphs [0026], [0029] and [0042] have been amended to correct minor editorial problems.

Claims 1-30, 32-50, and 52-65 remain pending in the application and are shown above. Claims 1-62 are rejected according to the Office Action Summary, but no rejection over claims 30, 31, and 52 has been made in the Detailed Action. Claim 8 is objected to. Reconsideration of the rejected claims is requested for reasons presented below.

Claims 8, 11, 13, and 60 are amended to correct matters of form. Claims 1, 20, 30, 40, 50, and 59 are amended to clarify the invention. Claims 1, 20, 40, and 59 are amended to require maintaining a chamber pressure of about 100 to about 150 Torr throughout a temperature reduction or cooling. Claims 63-65 have been added to require maintaining a chamber pressure of about 100 to about 150 Torr. Claims 30 and 50 are amended to correct matters of form required by the amendment to claims 20 and 40. Claims 31 and 51 are canceled with their subject matter incorporated into claims 20 and 40 respectively. These amendments are not presented to distinguish a reference, thus, the claims as amended are entitled to a full range of equivalents if not previously amended to distinguish a reference. Support for the amendments can be found in paragraph [0038].

Claim 8 is objected to because claim 8 depends on claim 1 and cited the limitation "step d". Claim 1 has no "step d". Claim 8 has been amended to correct the error.

Claims 1-3, 5, 9, 10, 14, 20-22, 24, 28, 29, 33, 34, 40-42, 44, 48, 49, 53 are rejected under 35 U.S.C. § 102 as being anticipated by *Gross et al.*, (U.S. Patent No. 6,297,154, hereafter "*Gross*") on grounds that *Gross* forms a dielectric layer having a feature on a substrate, deposits a metal layer in the feature, purges the system of

oxidizing gases, and anneals the metal layer. The examiner further alleges that reducing the temperature of the copper layer to a temperature of about 50 °C to about 100 °C in a period of about 30 seconds is obvious because the substrate would inherently cool down to a handling temperature while the time to cool would be routine optimization. Applicant respectfully traverses the rejection.

The reference *Gross* does not disclose or suggest maintaining a chamber pressure of about 100 to about 150 Torr throughout the temperature reducing or cooling as required by claims 1, 20, and 40. Further, maintaining the chamber pressure of about 100 to about 150 Torr throughout the temperature reducing or cooling would not be obvious. In paragraph [0038], Applicant has stated that if the pressure is too high once the cooling begins, the heat transfer will likely be impeded and if the pressure is too low, the heat transfer will likely be sub-optimal. Applicant has shown the criticality of the pressure range. Thus, the claims are neither anticipated nor obvious. Therefore, *Gross*, alone or in combination, do not teach, show, or suggest maintaining a chamber pressure of about 100 to about 150 Torr throughout the temperature reducing or cooling, as recited in claims 1, 20, and 40, and claims dependent thereon. Withdrawal of the rejection is respectfully requested.

Applicant further traverses the rejection of dependent claims 2, 3, 5, 9, 10, 14, 21, 22, 24, 28, 29, 33, 34, 41, 42, 48, 49, and 53 on grounds that they depend from claims 1, 20, and 40 which are believed to be allowable as noted above. Withdrawal of the rejection is respectfully requested.

Claims 4, 6-8, 11-13, 15-19, 23, 25-27, 32, 35-39, 43, 45-47, 50-51, 54-58, 59-62 are rejected under 35 U.S.C. § 103(a) as being unpatentable over *Gross et al.*, (U.S. Patent No. 6,297, 154, hereafter "*Gross*") on grounds that reducing the temperature of the copper layer to a temperature of about 50 °C to about 100 °C in a period of about 30 seconds is obvious because the substrate would inherently cool down to a handling temperature while the time to cool would be routine optimization. Applicant respectfully traverses the rejection.

The reference *Gross* does not disclose or suggest maintaining a chamber pressure of about 100 to about 150 Torr throughout the temperature cooling as required by claims 1, 20, 40, and 59. Further, maintaining the chamber pressure of about 100 to

about 150 Torr throughout the temperature reducing or cooling would not be obvious. In paragraph [0038], Applicant has stated that if the pressure is too high once the cooling beings, the heat transfer will likely be impeded and if the pressure is too low, the heat transfer will likely be sub-optimal. Applicant has shown the unexpected results of the pressure range. Thus, the claims are neither anticipated nor obvious. Therefore, *Gross*, alone or in combination, do not teach, show, or suggest maintaining a chamber pressure of about 100 to about 150 Torr throughout the temperature reducing or cooling, as recited in claims 1, 20, 40, and 59, and claims dependent thereon. Withdrawal of the rejection is respectfully requested.

Regarding claims 15, 35, and 54, the reference *Gross* does not disclose or suggest reducing the temperature of the copper layer to a temperature in the range of about 50 degrees Celsius to about 100 degrees Celsius within a period of about 30 seconds. It is pure speculation to say that the specific temperature to which Applicant cools and the rapid cooling rate (i.e. in about 30 seconds) is merely routine optimization. *Gross* does not provide any cooling at all. At most, *Gross* allows cooling to occur naturally after processing, without any intentional, forced cooling. By natural cooling it is understood to require no active effort to cool the substrate beyond what would naturally occur. Even if it is obvious to say that *Gross* allows the substrate to cool naturally to a handling temperature, it is not obvious to say that *Gross* performs active cooling on the substrate. There is no suggestion to intentionally cool down the substrate at a rate faster than natural cooling. The instant invention specifically requires reducing the temperature of the substrate to a certain range (i.e. to about 50 degrees Celsius to about 100 degrees Celsius) within a specific time period (i.e. in about 30 seconds). In order to cool the substrate of *Gross* in the manner claimed by Applicant, some sort of effort beyond merely allowing the substrate sit and cool will be required. *Gross* does not teach or suggest ANY cooling, and intentionally cooling the substrate in *Gross* within a specific time period is not obvious. Therefore, *Gross*, alone or in combination, does not teach, show, or suggest reducing the temperature of the copper layer to a temperature in the range of about 50 degrees Celsius to about 100 degrees Celsius within a period of about 30 second, as recited in claims 15, 35, and 54, and claims dependent thereon. Withdrawal of the rejection is respectfully requested.

Applicant further traverses the rejection of dependent claims 4, 6-8, 11-13, 16-19, 23, 25-27, 32, 36-39, 43, 45-47, 50, 51, 55-58, and 60-62 on grounds that they depend from claims 1, 15, 20, 35, 40, 54, and 59 which are believed to be allowable as noted above. Withdrawal of the rejection is respectfully requested.

In conclusion, the references cited by the Examiner, alone or in combination, do not teach, show, or suggest the invention as claimed.

The secondary references made of record are noted. However, it is believed that the secondary references are no more pertinent to the Applicant's disclosure than the primary references cited in the office action. Therefore, Applicant believes that a detailed discussion of the secondary references is not necessary for a full and complete response to this office action.

Having addressed all issues set out in the office action, Applicant respectfully submits that the claims are in condition for allowance and respectfully request that the claims be allowed.

Respectfully submitted,



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